Draft

July 8, 2008

M E M O R A N D U M

TO: Steven Tanner, Engineering Manager
Coeur d'Alene Regional Office

FROM: Jennifer Wester, E.I.T.
Technical Services Division

SUBJECT: Bayview Water and Sewer District Wastewater Reuse Permit Application Review – LA-000105-03 (Municipal Wastewater)

1.0 Purpose

The purpose of this memorandum is to satisfy the requirements of IDAPA 58.01.17.400.04 (Wastewater Reclamation and Reuse Regulations) for issuing land application permits. It states the principal facts and significant questions considered in preparing the draft permit conditions or intent to deny, and a summary of the basis for approval or denial with references to applicable requirements and supporting materials. This memorandum supplements the memorandum dated May 9, 2002.

2.0 Project Description

The Bayview Water and Sewer District (hereafter BWSD) is located adjacent to Lake Pend Oreille, approximately fifteen miles southeast of Sandpoint, Idaho; the legal location is Township 54N, Range 02W. The land application acreage is located in portions of Sections 26 and 27 in Bonner County and is 0.4 miles from the shoreline of Lake Pend Oreille. The site has been used for land application of municipal wastewater generated in the community of Bayview since 1992. In 2006 the wastewater collection system for the district had a new piping network installed following the point of chlorine injection in order to improve chlorine contact time and mixing prior to discharge to the irrigation storage. No changes have been made to the land application site. For details of this system, please refer to the memorandum dated May 9, 2002, included in Section 7.1 of the Appendix.

3.0 Summary of Events

The facility initially received a Wastewater Land Application Program (WLAP) permit on June 18, 1991. The facility was re-permitted on July 1, 2002 (hereafter 'current permit'). BWSD submitted an application for re-permitting on February 2, 2007 (hereafter BWSD, 2007b). This application was determined to be complete by DEQ on March 28, 2007.

4.0 Discussion

The following is a discussion of the plan of operation, hydraulic management unit configuration, wastewater storage structures, buffer zones, wastewater flows and constituent loading, ground water, and soils. Conclusions and recommendations are provided in Section 5 below.

4.1 Plan of Operation

It is understood that a plan of operation is a living document and is modified as operations and regulatory requirements change. Due to the addition of the chlorine contact gallery to the treatment system, Section E, condition CA-105-01, as it appears in the attached draft permit, requires the facility to submit for DEQ review and approval, a revised plan of operation. For the full text of the condition, see Section E of the attached draft permit.

4.2 Hydraulic Management Unit Configuration

There have been no significant changes at the facility during the present permit cycle with respect to wastewater land treatment acreage. The irrigation configuration remains solid set irrigation lines on three hydraulic management units totaling 20.6 acres. The facility does not plan on expanding their land application site during the next permit cycle.

4.3 Wastewater Storage Structures

The facility has one 10,000-gallon lined wastewater irrigation reservoir below the sand filters. In the past this structure was used to allow for sufficient chlorine contact time in order to meet the disinfection requirements. This purpose is now met by the chlorine contact gallery which has been in use since 2002 and it seems that the irrigation reservoir is now used solely for equalization storage. Since it is not known whether the structure has been tested for leakage, staff recommends that a seepage test be performed on the reservoir during the next permit cycle.

4.4 Buffer Zones

The facility has complied with the buffer zones required by the past two permits and there have been no significant changes to the wastewater volume or nutrient concentrations. For Class C wastewater in a rural area with sprinkler irrigation, the following buffer zones are proposed:

- ✓ 300 ft from reuse site to inhabited dwellings
- ✓ 0 ft from reuse site to areas accessible by the public
- ✓ 100 ft from reuse site to permanent and intermittent surface water
- ✓ 50 feet from reuse site to irrigation ditches and canals
- ✓ 500 feet from reuse site to private water supply wells[1]
- ✓ 1000 feet from reuse site to public water supply wells[1]
- ✓ Berms and other BMPs shall be used to protect the well head of on-site wells.

1) These buffer zone distances shall be maintained unless a Department-approved well location acceptability analysis indicates an alternative buffer zone is acceptable

4.5 Wastewater Flows and Constituent Loading Rates

Trending of wastewater flow rates and rationale for constituent and hydraulic loading rates appearing in the draft permit are discussed below.

4.5.1 Wastewater Flows

Wastewater generation data from the operating years of the current permit show some fluctuation in annual wastewater generation, from 5.14 million gallons (MG) per year in 2002 (BWSD, 2003) to 6.66 MG in 2004 (BWSD, 2005). It is recommended that permitted constituent loading rates substantially reflect both what is currently practiced and, where appropriate, what is realistically anticipated during the life of the permit, provided such rates are determined protective by DEQ.

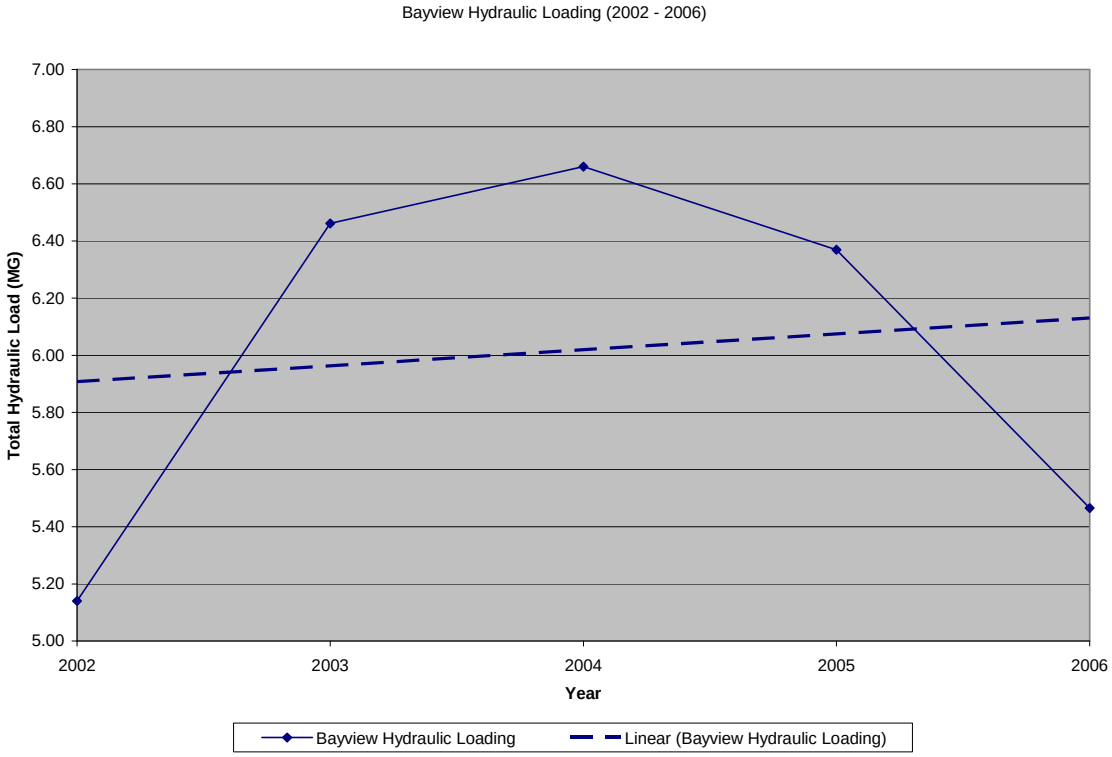
4.5.2 Constituent Loading Rates

The sections below discuss proposed constituent loading rates, including hydraulic, nitrogen, and phosphorus. Changes to the current loading rates for inclusion into the draft permit, Section F, are also discussed.

4.5.2.1 Hydraulic Loading Rates

Growing season hydraulic loading should be substantially equal to the irrigation water requirement (IWR) for a forested site. As discussed in Section 4.4.1, the facility has not yet approached the maximum hydraulic limit of 14.5 MG developed for the current permit (see attached memo in Appendix 7.1). Figure 1 shows the trend in hydraulic loading for the current permit cycle (2002 through 2006). Over the first four years of operation, the maximum hydraulic loading occurred in 2004 and has decreased each year since then. The dashed line is the linear trend of the data and shows that the facility will not even approach the current permit limit of 14.5 MG until well beyond the next permit cycle, if the trend continues.

Figure 1 Hydraulic loading trend for Bayview Water and Sewer District



Due to nutrient loading concerns which will be discussed in Section 4.4.2.2, it is proposed that a hydraulic loading limit of 8.90 MG be imposed for the next permit cycle as shown in Table 1. Since there is little water use data for trees, the forest at the application site was approximated with values taken from the ET_{Idaho} website for 25% Orchard without Groundcover and 75% Range Grasses with a sprinkler efficiency of 85%. Please see Appendix 7.2 for a fuller description of the process used to derive the irrigation rates.

Table 1 Maximum Hydraulic Loading Rate for Bayview Water and Sewer District

Month	Application (Inches)*	Application (MG)
May	1.78	0.99
June	3.88	2.17
July	4.91	2.75
August	3.44	1.92
September	1.91	1.07
Total	**15.91**	**8.90**

*Based on ET data from http://www.kimberly.uidaho.edu/ETIdaho/stninfo.php?station=100667 for a representative mix of 25% Orchard without Groundcover and 75% Range Grasses, assuming 85% sprinkler efficiency.

This change from the previous permit in the monthly hydraulic loading rates does not appear to impact the District's ability to irrigate as they have in the past (based on the 2007 Annual Report). The maximum irrigation for September according to the above table includes an

allowance based on the average rainfall for the region. The facility has limited storage available for use so flow received from the District must be used for irrigation or applied to the drainfield. The facility is encouraged to manage the site in accordance with acceptable management practices and local meteorology.

4.5.2.2 Nitrogen Management and Loading Rates

According to the facility's annual reports (see Figure 2), the total nitrogen applied to the entire site has ranged from 89.2 lbs/acre in 2002 (BWSD, 2003) to 169.1 lbs/acre in 2005 (BWSD, 2006) and these loading practices do not appear to have been detrimental to the site. The current limit, as stated in the permit, is "125% of typical crop uptake, or UI Fertility Guide." The "typical crop uptake" for this site has been previously estimated to be 80 – 220 lbs/acre as stated in the application materials (BWSD, 2007b) and the memorandum accompanying the current permit (see Section 7.1 of the Appendix). No changes to the nitrogen loading limits were requested by the facility; however staff intends for this permit be consistent with other permits for forested sites by developing numerical constituent loading rates that are representative of the vegetation on the site. BWSD's application site consists of primarily Douglas fir with significant understory due to past logging activities in the area. Data (Henry et al, 1999) for Douglas fir estimates nitrogen uptake for a juvenile plantation (aged 3 – 25 years) at 110 lbs/acre for complete canopy and the understory at 100 lbs/acre, depending upon coverage. The canopy was estimated to be 75% of full canopy with 100% understory coverage, which gives a numerical value for the nitrogen uptake of 183 lbs/acre, as shown below. At 125% of crop uptake, the nitrogen loading limit for the next permit cycle is 228 lbs/acre.

Equation 1 Calculation of Nitrogen Uptake for Douglas Fir Forest

$$C_{est} * N_{can} + U_{est} * N_{under} = NU_{est}$$

where C_{est} = estimated canopy coverage (75%)
N_{can} = nitrogen uptake by complete canopy = 110 lb/acre-year
U_{est} = estimated understory coverage (100%)
N_{under} = nitrogen uptake by complete understory = 100 lb/acre-year
NU_{est} = site estimated nitrogen uptake

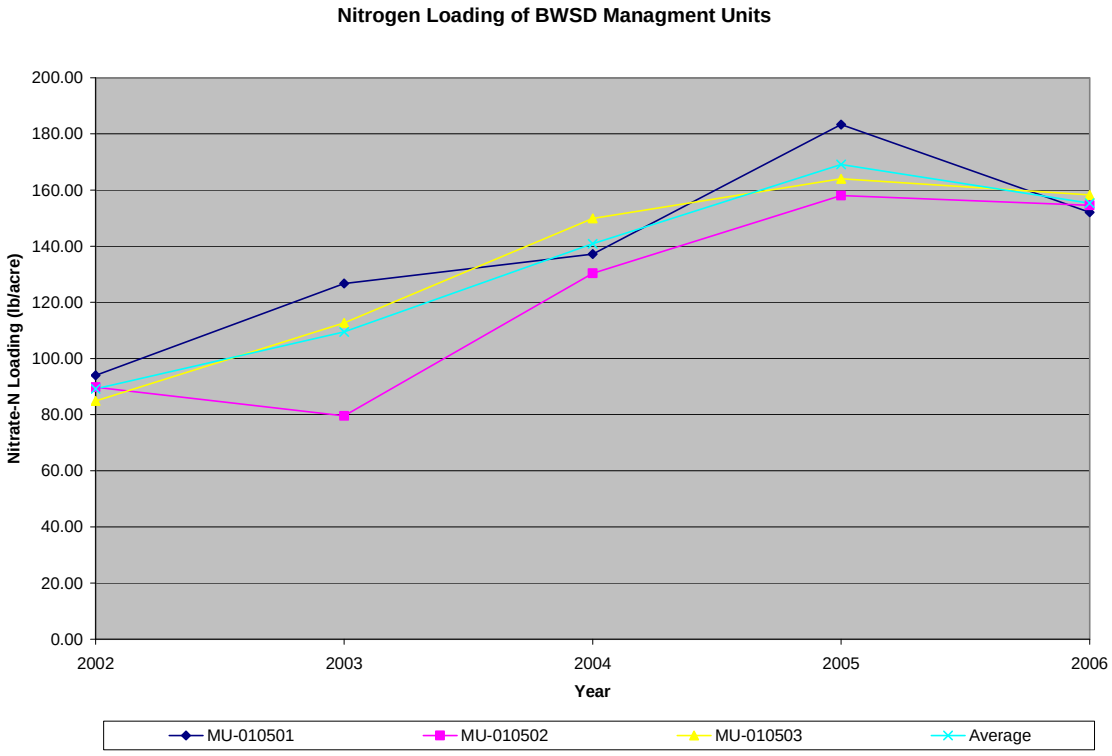
Solving for NU_{est}:

$$NU_{est} = C_{est} * N_{can} + U_{est} * N_{under} = 0.75\ (110) + 1.00\ (100) = 83 + 100$$

$$NU_{est} = 183 \text{ lb/acre-year}$$

The facility's nitrogen application for 2006 appears to be lower than previous years, which makes forecasting loading trends difficult. Regardless of whether 2006 is merely an anomaly or a true representation of an improvement in the facility's nitrogen loading rates, for the next permit cycle BWSD is encouraged to work with the Regional Office to develop additional means to ensure that their loading rates remain below 228 lbs/acre.

Figure 2 Wastewater Nitrate-N Loading Trends for Bayview Water and Sewer District



4.5.2.3 Phosphorus Loading Rates

The current permit includes a phosphorus (P) loading limit given as "125% of typical crop uptake, or UI Fertility Guide." Phosphorus loading rates are generally set by DEQ based upon either ground water or surface water concerns. With respect to ground water concerns, DEQ does not usually set a phosphorus loading limit where there is no ground water/surface water interconnection (i.e. where ground water discharging from the down-gradient boundary of the treatment site does not enter surface water). There are no seasonal tributaries immediately adjacent to the facility. Also, the facility applies P at relatively low rates, between 12.7 lbs/acre (BWSD, 2003) and 15.8 lbs/acre (BWSD, 2005). In addition, wastewater is not applied during precipitation events as a means to minimize runoff (and potentially phosphorus-bearing sediment runoff) therefore phosphorus contamination in the nearest surface water (Lake Pend Oreille) should not become a concern during the new permit cycle. A runoff control plan is also included as a compliance activity in Section E, CA-182-05 of the draft permit. As a consequence, staff recommends removing the numerical phosphorus loading limit in the draft permit.

4.6 Ground Water

Various facility annual reports provide data and discuss ground water quality at the facility. This section discusses ground water impacts from wastewater land treatment, and ground water impacts to wells.

4.6.1 Ground Water Impacts from Wastewater Land Treatment

No groundwater monitoring program is required by the current permit, per the memorandum included in Appendix 7.1. There is one monitoring well on the site located inside the footprint of one of the large soil absorption system (LSAS) beds; however this well is beyond the scope of the Wastewater Reuse program and will not be monitored for compliance during the next permit cycle.

4.6.2 Municipal Wells in Proximity to Facility

As reported by the facility (BWSD, 2007b), there are no known public, private or injection wells located within ¼ mile of the land application site.

4.7 Soils

Soil samples over the last permit cycle have been analyzed for nitrate-N, ammonia-N, electrical conductivity, pH and plant available phosphorus. Tables 2 and 3 give the soil results at the various depths for the required parameters over the last permit cycle.

Table 2 BWSD Soil Results 0" to 12" 2002 - 2006

Date	Nitrate (ppm)	Ammonia (ppm)	EC (umhos/cm)	pH	Phosphorus (ppm)
9/15/2002	6.09	2.9	229	7.11	18.7
9/15/2003	7.14	3.9	206	7.45	12.5
10/26/2004	4.25	1.39	116	7.46	15.3
11/7/2005	1.52	2.04	359	7.62	7.56
10/26/1006	0.91	2.6	2.79	7.11	6.09

Table 3 BWSD Soil Results 12" to 24" 2002 - 2006

Date	Nitrate (ppm)	Ammonia (ppm)	EC (umhos/cm)	pH	Phosphorus (ppm)
9/15/2002	2.46	ND	137	6.98	9.96
9/15/2003	3.21	2	133	7.15	14.5
10/26/2004	ND	1.46	93.9	7.21	9.79
11/7/2005	2.73	1.26	170	7.09	4.21
10/26/1006	2.77	1.7	230	7.34	9.03

The data show that the deeper soils generally contain less of the monitored constituents than those on or near the surface. The last two years of data (2005 and 2006) show a higher concentration of nitrate in the deeper samples. The 2004 data show a slight increase in ammonia in the deeper samples. For phosphorus, the concentration is also higher in the lower strata samples in 2003 and 2006. The soil pH is also generally higher in the shallower samples except in 2006. Over the last permit cycle, the data for the shallower soil samples show decreasing linear trends for all parameters except Electrical Conductivity (EC). No definitive trends or

conclusions can be drawn for the deeper samples due to inconsistency in the data. It is suggested that soil monitoring continue through the next permit cycle to monitor any effects of wastewater irrigation.

5.0 Conclusions

The following recommendations fall into two major areas. They include loading rate related and other recommendations.

5.1 Loading Rate Related Recommendations

1) It is recommended that the nitrogen loading limit be set at a numerical value of 228 lbs/acre, as discussed in Section 4.4.2.2.

2) It is recommended that the maximum phosphorus loading rate be removed from the draft permit as discussed in Section 4.4.2.3.

5.2 Other Recommendations

1) It is recommended that the facility perform seepage testing on the lagoon as discussed in Section 4.3. See Section E of the draft permit for the Compliance Activity.

6.0 References Cited

Department of Environmental Quality, *Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater*. December 2006 (referred to as the Guidance).

Bayview, 2003. Bayview Water and Sewer District. January 27, 2003. [2002]Annual Report, Wastewater Land Application Permit # LA-000105.

Bayview, 2004. Bayview Water and Sewer District. January 7, 2004. [2003]Annual Report, Wastewater Land Application Permit # LA-000105.

Bayview, 2005. Bayview Water and Sewer District. January 18, 2005. [2004] Annual Report, Wastewater Land Application Permit # LA-000105.

Bayview, 2006. Bayview Water and Sewer District. January 9, 2006. [2005] Annual Report, Wastewater Land Application Permit # LA-000105-02.

Bayview, 2007a. Bayview Water and Sewer District. January 3, 2007. [2006] Annual Report, Wastewater Land Application Permit # LA-000105-02.

Bayview, 2007b. Bayview Water and Sewer District. February 2, 2007. 2007 Technical Report Outline for WLA Re-Application.

cc: WLAP Source File no. LA-000105-03 (SO & CRO)
John Tindall, CRO
Mike Spomer, SO
Richard Huddleston, SO

7.0 Appendices

7.1 Memorandum dated May 9, 2002

May 9, 2002

M E M O R A N D U M

TO: Roger Tinkey, Engineering Manager
Coeur d'Alene, Regional Office

FROM: Doug Davidson, State Office of Technical Services

RE: Staff Analysis of Bayview Water and Sewer District, Wastewater Land Application Permit Application LA-000105-02 (Municipal Wastewater)

PURPOSE

The purpose of this memorandum is to satisfy the requirements of IDAPA 58.01.17.400.04 for issuing wastewater land application permits.

PROCESS DESCRIPTION

The Bayview Water and Sewer District is located adjacent to Lake Pend Oreille, fifteen miles southeast of Sandpoint, Idaho. The legal description is listed as T54N, R02W. The land application site is located in portions of sections 26 and 27 in Bonner County (See Appendix, Figure 5 and 6). The sewer district serves Scenic Bay in sections 34 and 35 as well as Vista Bay and MacDonald's Hudson Bay located in Kootenai County at T53N, R02W in section 2 and 3. The legal description was obtained from the Bayview and Cocolalla 1:24,000 United States Geological Survey (USGS) quadrangle. The land application site is located 0.4 miles from the shoreline of Lake Pend Oreille and is greater than 1,000 feet above the lake surface. The District land application program has been in practice since 1990. Locked gates along a Forest Service road restrict access to the land application site. The land application area is signed at each of the locked entrances.

The Bayview wastewater system consists of PVC gravity collection pipelines connected to individual septic tanks at each residence. Three duplex lift station are present in the Scenic Bay, Vista Bay, and MacDonald's Hudson Bay areas to lift the effluent up to the main gravity pipeline. The triplex lift station transports the effluent uphill by an eight-inch main line. During the land application season, the effluent is discharged into a 10,000 gallon dosing tank with a siphon system, which periodically doses the effluent to one of five sand filters. The filter is flooded from the dosing tank, allowing the effluent to leach through the sand medium for treatment and BOD removal. The wastewater is collected from the bottom of the sand filter and transported to an erosion chlorinator where the water is exposed to chlorine tablets and

transferred to the irrigation reservoir where a duplex pump system delivers the effluent to the land application sprinkler system in three separate fields. A subsurface adsorption bed field, consisting of two beds, is used for winter disposal of wastewater during the colder non-growing season. The delivery of the effluent to this site is achieved by shutting off the flow to the dosing siphon tank and pumping the effluent directly from the triplex pump station to the adsorption beds where it is distributed to one of the two beds.

SUMMARY OF EVENTS

The District has been in existence since 1990. On June 18, 1991, the Idaho Department of Environmental Quality (DEQ) issued the first permit for operation of the land application system based on an application received November 29, 1990. The land application system started operation in 1992. The permit expired June 17, 1996. On May 24, 2001, DEQ personnel visited the site with Neil Peck, the district's operator. A tour of the facility was given to DEQ personnel. An application for permit renewal of the existing permit was received at that meeting.

DESCRIPTION OF WASTEWATER TREATMENT AND LAND APPLICATION SYSTEM

The Bayview wastewater collection system is a gravity system with gravity sanitary lines coming from the outlying areas of Bayview on Lake Pend Oreille. Every connection within the District has gravity flow from a septic tank, which directly discharges into one of three main sanitary lines. Each main sanitary line has a duplex lift station to lift the effluent to the gravity line where it is delivered to a central triplex lift station located near the center of the city of Bayview (Appendix, Figure 6). The lift station contains three pumps with 75-horsepower electric motors. In the event of a power outage or mechanical breakdown, a generator is located within the lift station to provide electricity to continually pump the effluent. The wastewater is transferred from the triplex lift station through an eight-inch main line to the treatment area, which is over 1,000 vertical feet above the lift station. Depending upon the time of the year, the wastewater is either diverted to adsorption beds field (Figure 1) during the non-growing season or continues up to the

Figure 1. Adsorption Filter Beds Field

dosing siphon tanks, sand filters, and land application site (Appendix, Figure 7) during the growing season.

As stated above, during the non-growing season months, the wastewater is diverted from the main line into a six-inch lateral line, located within the adsorption bed field. A series of one-inch lines distribute effluent within the adsorption bed where natural attenuation of the wastewater occurs. There are two adsorption beds and each is 100,000 square feet. Each bed is designed for handling the projected winter flow. Normally only one bed is used each non-growing season.

Figure 2. Sand Filter with piping

During the growing season, the effluent is delivered to the 10,000 gallon dosing tank and the application site. A dosing siphon is used to deliver effluent to a series of sand filters (Figure 2) located down-gradient of the tank. Five sand filters are connected to the siphon tank with a manifold, which allows for the automatic switching between the filters. The operator has by-passed this option and normally limits use to one filter per growing season. Effluent is flooded onto the sand filter surface and allowed to seep through the sand for treatment. The effluent is contained at the bottom of the filter with drain tiles and PVC plastic lining. Filtered effluent is collected and transported out of the filter area with a collection pipe. The sand surface of the filter is rehabilitated after each year of use by mechanical cultivation method.

In the past, wastewater was transferred to a contact holding tank where chlorine tablets are eroded into the wastewater stream before draining into a high-density polyethylene lined irrigation reservoir (Figure 3). This reservoir provides storage for chlorine contact time and pumping reservoir. In addition, this is a point where the operator collects effluent samples to test water quality before the wastewater is delivered to the treatment area. The operator has stated that the district has had some effluent samples with high coliform counts, which he believes was caused by poor erosion of the chlorine tablets. During the May 2001 inspection, the operator stated that he planned to remove the erosion chlorinator and assemble, in-place, a hypochlorinator injection system. It is believed that greater consistency in low coliform counts will occur with the use of the hypochlorinator. That system is now in place and the tablet system has been removed.

A small pump house with a dry well for the pump and electric motors assemblage is positioned down gradient of the storage reservoir. The application system was originally designed for automated area application based upon previous watering cycles. The operator stated that the automated system did not function correctly, and he has disconnected the automated system and has

gone to a manual field selection system, stating that the new system works much better and is more reliable.

The land application site vegetation consists of grass, brush, and small evergreen and deciduous trees. The application site contains 27.8 acres separated into three separate fields of variable size where sprinklers are setup. Field one is 7.3 acres, field two is 6.5 acres, and field three is 14 acres. The three fields are also subdivided into seven irrigation zones. One irrigation zone in field three has enough elevation difference from the treatment area to provide the ability to gravity-apply the effluent, even in the event of a power outage. The sprinklers in the land application area are solid sets, elevated to about six feet above ground level for maximum height above vegetation and ease of application. The operator has calculated that the total acreage currently being for land application is 20.6 acres.

Figure 3. Effluent Reservoir with Liner

The application site has been logged [illegible] mounts of large trees. The slope of the land applicati[illegible]d application. The nearest surface water, two surface water springs, are located approximately 250 feet to the south of the site.

The design wastewater flow rates are 219,750 and 96,750 gallons per day (gpd) in the summer and winter, respectively (Operation & Maintenance Manual, January 1992). The highest flows occur during the summer months of July and August when full-time and seasonal residents are at a maximum. Actual flow rates are much lower than the original design rates. In 2000, the total annual wastewater flow was 18.6 million gallons (MG) or an average of 51,000 gpd. Approximately 9.4 MG was land applied during the growing season from May 1 to September 30 (153 days) and the remainder (9.2 MG) was delivered to the subsurface system in the non-growing season.

For land application on a tree site, the estimated irrigation water requirement is approximately 25.92 inches per year. Based on hydraulic application rates, the entire 27.8 acre site would support land application of approximately 19.6 MG per year during the growing season. The District currently used 20.6 acres, which would support land application of approximately 14.5 MG per year.

The permit that is in effect requires that the disinfection system treat the effluent to a total coliform level of 23/100 milliliters or less during land application. With the addition of hypochlorite solution treatment replacing the contact erosion tablet system, reduction of total coliform should be more

consistent. Staff recommends the 23/100 milliliters total coliform limit for the new permit with a maximum of 240/100 ml at any one time. The compliance will be based on the median of the last five sample results with a rolling basis.

SITE CHARACTERISTICS

The land application site is located about 0.4 miles northwest of Bayview and approximately 1,060 feet above the elevation of the triplex lift station. The site is a mixture of open meadow grass with young deciduous and evergreen trees. Most of the older vegetation in the application field has been removed. The land has a gentle slope to the southwest. The site has been split into three application areas that have been divided into seven irrigation zones. Six of the zones are fed by a pump-pressurized system while the seventh area has sufficient elevation drop to supply a gravity pressure delivery system.

The soils for the site listed are the Bonner, Lenz, and Treble taxonomy. All three soils consist of a shallow sandy, silt loam horizon with gravelly sandy loam or sand below. All three have permeability in the top 8-12 inches that is listed a moderate to moderately-high 0.6-6.0 inches per hour and a moisture capacity of 0.08 – 0.21 inches per inch of soil. The permeability increases as the soil material moves towards a sand/gravel medium. The permeability is greater than 6.0 inches per hour with moisture capacity decreasing to a low 0.03 – 0.09 inches per inch.

PROJECTED WASTEWATER QUALITY AND LOADING RATES

Effluent quality to land application is shown in the table below.

Table 2. Wastewater Quality

Constituent	Effluent (milligrams per liter)
Chemical Oxygen Demand	101
Total Nitrogen	30
Total Phosphorus	4 (estimate)

Loading rates are shown in Table 3 for two cases, 20.6 acres (current area used) and 27.8 acres (total area available). The loading rates are based on land application of 9.4 MG/year.

For a tree site, staff estimates the nitrogen uptake range to be approximately 80 to 220 lbs./acre and the permit limit is set at 125% of uptake or 275 lbs./acre. Assuming a 275 lbs./acre nitrogen loading rate limit, the land application site does not exceed the nutrient loading rates. The nitrogen uptake for forest sites covers a wide range and actual data is limited for this type of application. At this site, the projected nitrogen application rate is below the upper end of estimated crop uptake. The upper range of nitrogen loading rates will be allowed, but continued application is dependent upon annual soil sampling. These samples will be used for the recommendation to monitor for any soil nitrogen accumulation, which could result in ground water contamination.

Table 3. Comparison of Current Loading Rates versus Permit Limits

Constituent	Loading Rate using 27.8 acres	Loading Rate using 20.6 acres	Basis for Municipal Permit Limit	Projected Municipal Permit Loading Rate Limit
Hydraulic Loading Rate, Growing Season	12.45 inches	16.80 inches	Irrigation Water Requirement for the crop grown	25.92 inches
Hydraulic Loading Rate, Non-growing Season	None	None	Soil AWC[1] plus Crop Evapotranspiration minus NGS[2] effective precipitation	None Allowed
COD[3], Growing Season (153 days, May 1 through Sep 30)	1.86 pounds per acre-day	2.5 pounds per acre-day	Growing season average not to exceed 50 pounds per acre-day	50 pounds per acre-day
Total Nitrogen	114.2 pounds per acre	84.6 pounds per acre	125% of crop uptake	275 pounds per acre
Total Phosphorus	15.2 pounds per acre	11.3 pounds per acre	125% of crop uptake	25 pounds per acre

1. Available Water Capacity
2. Non-growing season
3. Chemical Oxygen Demand

The projected growing-season Chemical Oxygen Demand (COD) loading rate is approximately 2 pounds/acre-day or about 4% of the DEQ guideline rate of 50 pounds/acre-day. Due to the low COD loading rate, staff recommends COD monitoring requirements and loading limits be excluded from this permit.

Projected Permit Limits, Hydraulic Loading Rates

The growing season for this project will be from May 1 through September 30 (153 days). Land application during the non-growing season is not proposed and will not be allowed in the permit. The following equation was used for the hydraulic loading rate for the growing season:

$IWR = [Cu - (PPT_e + \text{carry over soil moisture}) + LR]/E_i$.

IWR is the irrigation water requirement or the hydraulic loading rate for the growing season
Cu is the crop consumptive use
PPT_e is the effective precipitation
LR is the leaching rate
E_i is the irrigation efficiency

For permit purposes, the soil carryover moisture and leaching rate are assumed to be zero in calculating the irrigation water requirement. A leaching rate of zero is used since soils in this area are not saline and need no additional hydraulic load for leaching.

Tables 4 and 5 show the irrigation water requirement for a tree site in this area. The estimated irrigation water requirement will be approximately 25.92 inches (14.5 MG on 20.6 acres, 19.6 MG on 27.8 acres). The currently used land application area of 20.6 acres will satisfy hydraulic loading requirements.

Table 4. Irrigation Requirements by Month for Trees in North Idaho*

Month	Bayview Effective Precipitation, inches	Consumptive Use, inches	Irrigation Water Requirement, inches	Irrigation Water Requirement for 20.6 acres (MG)
May	1.44	2.61	1.56	0.87
June	1.27	4.87	4.79	2.68
July	0.71	7.37	8.88	4.97
August	0.76	5.82	6.75	3.78
September	0.85	3.80	3.94	2.20
Total	5.03	24.47	25.92	14.50

* Source: *Estimating Consumptive Irrigation Requirements for Crops in Idaho,1983* by R.G. Allen and C.E. Brockway

Table 5. Total Irrigation Water Requirements for Trees Grown in North Idaho

CROP	CU, inches	PPT_e, inches	E_I (%)	IWR (in.)
Trees	24.47	5.03	75%	25.92

Projected Permit Limits, Nutrients

Staff recommend permit limits be set at 125 per cent of nutrient uptake. The nutrient requirements for a tree site are relatively low if nutrient removal occurs only when trees are harvested. Nutrients in the surface vegetation (if not harvested and removed) will be recycled and put back into the site. Staff recommends annual soil sampling to monitor for buildup of nutrients.

Table 6 provides estimated crop uptake values for trees and the projected permit limits versus the projected loading rates.

Table 6. Nutrient Crop Uptake versus Application Rates

Constituent	Estimated Crop Uptake	125% of Estimated Crop Uptake	Projected Application Rate[1]
Total Nitrogen	80 - 220 pounds/acre	100-275 pounds/acre	114.2 pounds/acre
Total Phosphorus	20 pounds/acre	25 pounds/acre	13.3 pounds/acre

1. Assuming application of 9.4 MG on 20.6 acres.

GROUND WATER CONSIDERATIONS

Ground water is located approximately 80-100 feet below ground surface. Ground water contamination should not be a concern for this site as long as hydraulic and nutrient loading limits are not exceeded.

SURFACE WATER CONSIDERATIONS

Buffer zones of 100 feet or more are recommended to protect natural surface waters from possible contamination. There are no surface water systems within this buffer range. Two springs are located greater than 250 feet from the application site. No water quality parameters have been exceeded during the application period and no water quality trends have been established. Staff recommends that the sampling requirement for the two springs be discontinued. No environmental impacts to surface water or the springs are likely at the loading rates specified in the permit. Lake Pend Oreille is located approximately 0.4 mile from the land application area.

Figure 4. Hanson East Spring

BUFFER ZONES

Bayview typically disinfects effluent to a total coliform level of 23/100 ml or less prior to land application. The site is located in a semi-rural area with solid set sprinklers used for land application. For this type of system, buffer zones of 300 feet or more are required between land application areas and homes. Buffer zones of 500 feet or more to private wells and 1,000 feet or more to a public water supply source are also required. Table 7 summarizes buffer zones provided by the existing system. Adequate buffers are provided.

Table 7. Buffer Zone Summary

Buffer Object	Minimum Buffer Distance (feet)	Actual Distance Provided (feet)
Nearest inhabited dwelling	300	> 300
Private water supply	500	> 500
Public water supply	1,000	>1,000
Natural surface water	100	>250

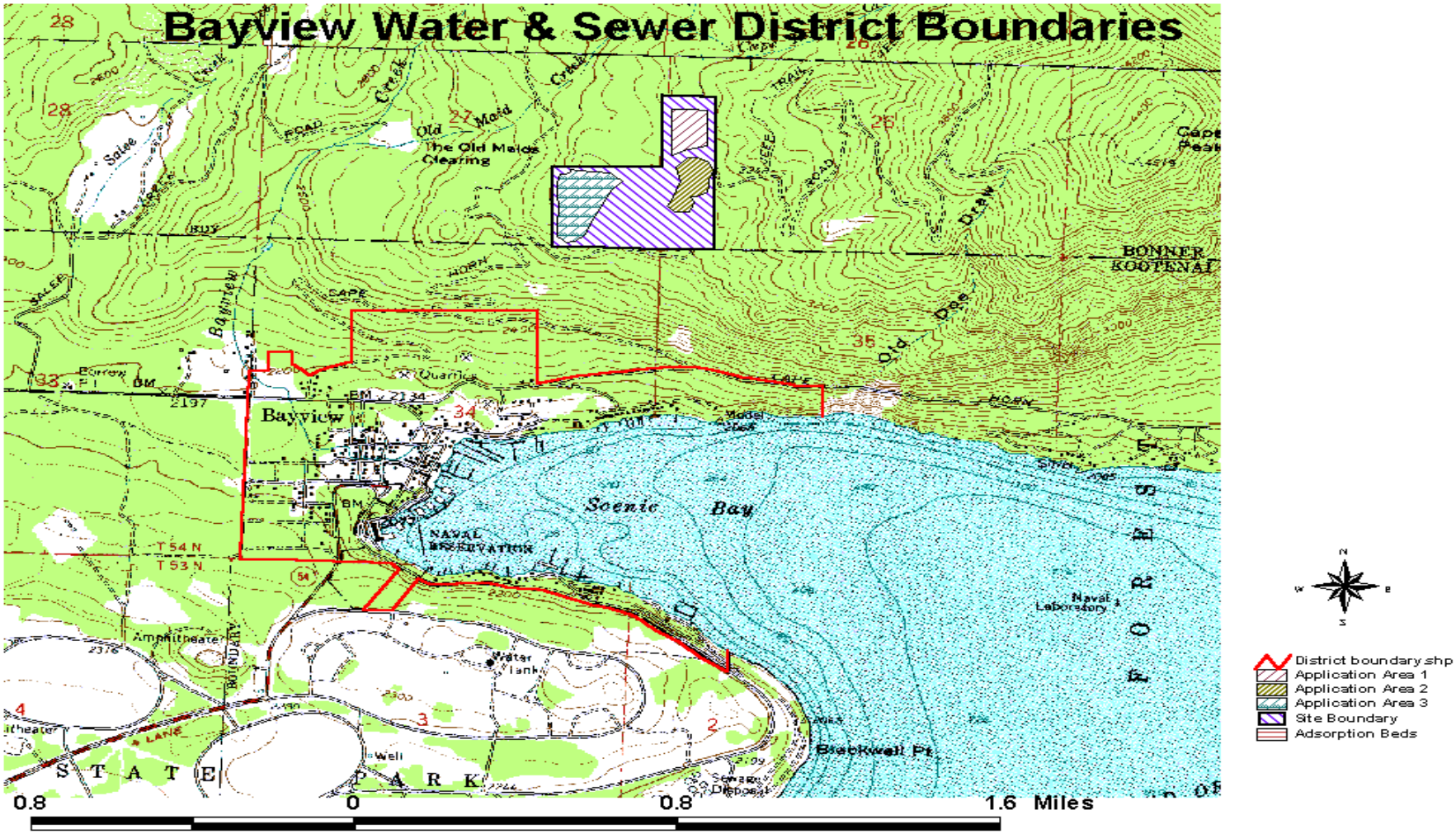
SITE SPECIFIC CONDITIONS

The operations and maintenance manual should be updated to include the changes that have taken place in the operation of the application system, such as the removal of the computer for field selection, bypassing of the automatic filter bed selection to a manual setting and chlorine system revisions.

RECOMMENDATION

DEQ staff recommend issuance of the attached draft permit. The draft permit contains loading limits for nutrients and hydraulic loading rates. Monitoring and reporting requirements to evaluate system performance and to determine permit compliance have been specified.

Appendix


Bayview Water & Sewer District Boundaries
Bayview
Scenic Bay
NAVAL RESERVATION
Naval Laboratory
Blackwell Pt
STATE PARK
BONNER
KOOTENAI
T 54 N
T 53 N
0.8
0
0.8
1.6 Miles
District boundary.shp
Application Area 1
Application Area 2
Application Area 3
Site Boundary
Adsorption Beds

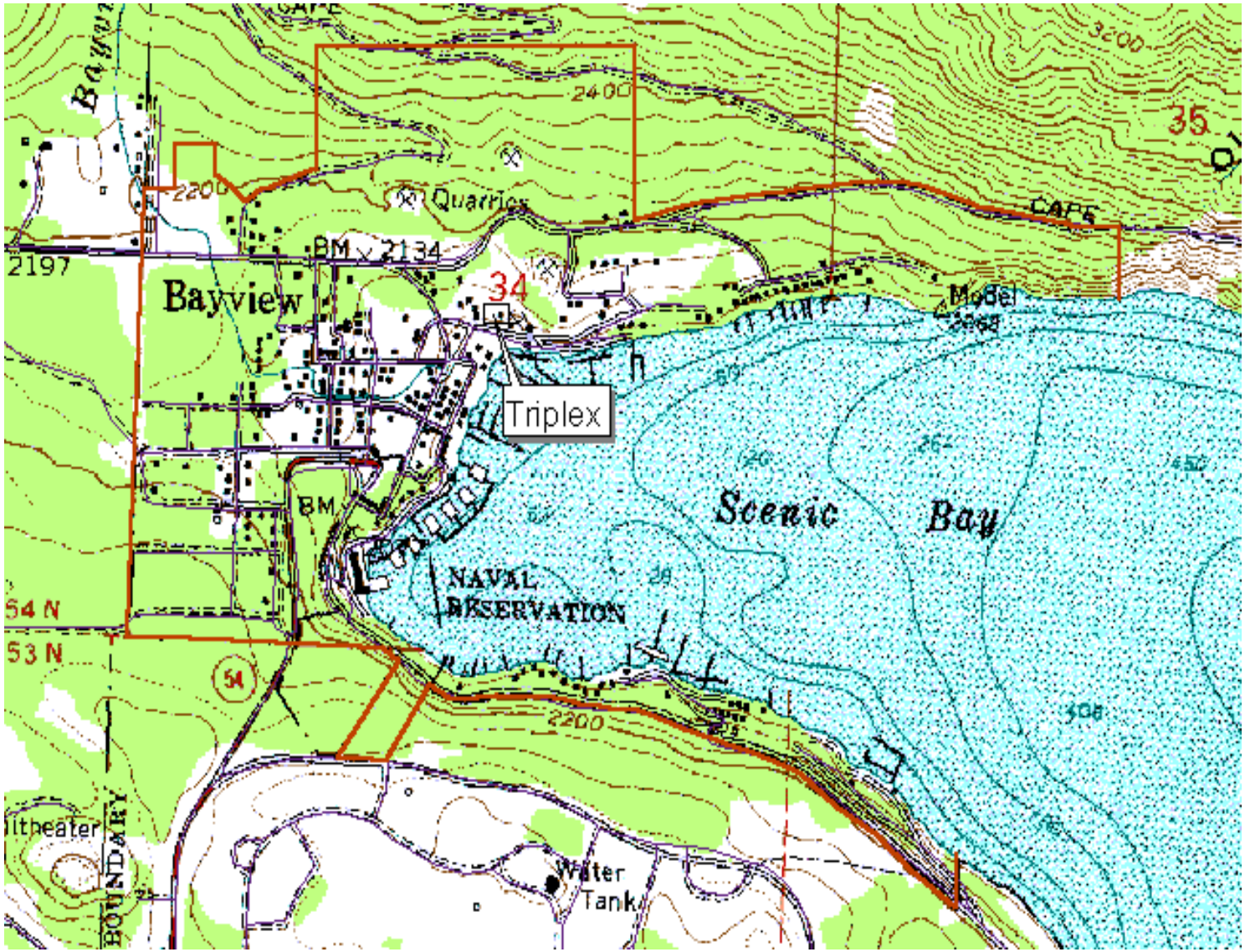


Figure 6. Bayview Boundary

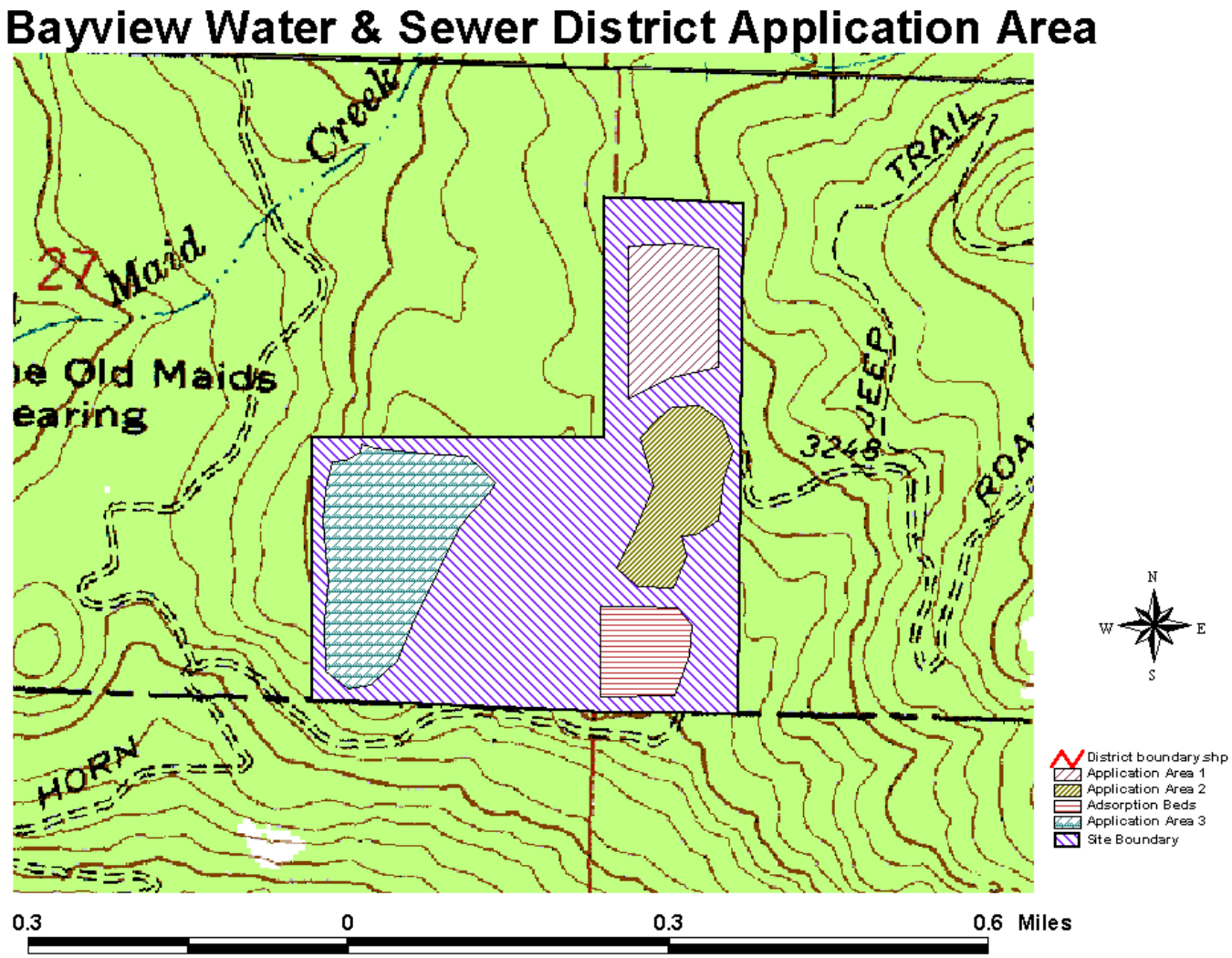


Figure 7. Bayview Land Application Boundaries

7.2 Irrigation Rate Formulation Methodology

No data currently exist for natural forest hydraulic or nutrient loadings. The IWR values for growing season application for BWSD (Table 1) were estimated using precipitation deficit (P_{def}) data available for "Orchards – Apples and Cherries no ground cover" and "Range Grasses – long season" from the ET_{Idaho} Bayview Model Basin station http://www.kimberly.uidaho.edu/ETIdaho/stninfo.php?station=100667). Table 4 shows the data taken from the ET_{Idaho} website for both categories.

Table 4 Precipitation Deficit (P_{def}) Data

	Orchards – no ground cover		Range Grasses	
	mm/day	in/month*	mm/day	in/month*
January	-0.38	-0.164	-0.77	-0.940
February	0.09	0.099	0.00	0.000
March	0.25	0.305	0.09	0.110
April	0.41	0.484	0.16	0.189
May	1.14	1.391	1.27	1.550
June	3.61	4.264	2.52	2.976
July	4.65	5.675	3.01	3.673
August	4.15	5.065	1.81	2.209
September	1.96	2.315	0.26	0.307
October	0.11	0.134	-0.65	-0.793
November	-1.77	-2.091	-2.09	-2.469
December	-1.58	-1.928	-1.87	-2.282

* Calculated value (ET_{Idaho} data in mm/day / 25.4 in/mm ***** #days in month)

Since the facility is irrigating natural forest instead of a single-season crop such as alfalfa or hay, it was determined to tie the growing season application rate to the IWR. Since tree cover on the site is uneven with some dense stands and open meadows, a mixture of 25% Orchard and 75% Range Grasses was used to estimate the water requirements. Table 5 shows the composited values used for the growing season IWR for BWSD. Negative values represent months where little or no growth takes place.

Table 5 Composited P_{def} Values for BWSD "Forest"

Month	P_{def}*
January	-0.821
February	0.025
March	0.159
April	0.263
May	1.510
June	3.298
July	4.174
August	2.923
September	0.809
October	-0.561
November	-2.374
December	-2.194

* Expressed in inches per month

In September, the facility has applied an average of 1.215 MG during the month of September. The average September precipitation for the Bayview area is 1.25 inches or 0.041 inches per day. Fruit trees such as those used in this estimation use most of their water uptake to produce fruit which is generally harvested in the early fall. A natural forest system will not experience the same drop in water requirement; therefore an estimate of 75% of the average precipitation was added to the calculated September irrigation rate. The irrigation water requirement is intended to serve as a guide for the application of water to the crop during the growing season. Actual application rates are expected to be substantially equal to these values, allowing for variations in yearly precipitation. Table 6 shows the additional volume for the composited "forest" system.

Table 6 BWSD "Forest" with Precipitation Allowance

Month	Calculated Irrigation Rates*
May	1.510
June	3.298
July	4.174
August	2.923
September	1.747

* Expressed in inches per month

From Table 4-12 of the *Guidance*, the system efficiency was estimated to be 85%. In order to represent the application system effectively, the values in Table 6 were divided by the efficiency of the distribution system and the resulting values are given in Table 1. The irrigation system is discussed in Sections 4.2, and 7.1.